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**Oral Health in North Carolina: Regional and Demographic Disparities in
Dentist Visits, Teeth Cleaning and Teeth Extraction
Data from the Behavioral Risk Factor Surveillance System, Years 2006, 2008, & 2010**

Introduction:

This report focuses on differences in the use of dental services and loss of teeth by necessary extraction by regions, income, education, race/ethnicity, and age in North Carolina. Data for the report were collected by the North Carolina Behavioral Risk Factors Surveillance System (BRFSS)¹.

The North Carolina (BRFSS) is a large scale telephone survey of adults 18 years or older by the Centers for Disease Control and Prevention (CDC) in collaboration with the North Carolina State Center for Health Statistics (SCHS). The questionnaire collects data on health risk behaviors and the use of health services. The questions on oral health were asked every other year since 2004 and consisted of the following three questions:

- 1. How long has it been since you last visited a dentist or a dental clinic for any reason?*
- 2. How long has it been since you had your teeth cleaned by a dentist or dental hygienist?*
- 3. How many of your permanent teeth have been removed because of tooth decay or gum disease? Do not include teeth lost for other reasons, such as injury or orthodontics.*

The NC BRFSS data from 2006, 2008, and 2010 were combined for analyses to obtain large sample sizes for valid comparisons. The SUDAAN statistical software was used to analyze the BRFSS data to utilize its complex sampling designs and present population representative means and confidence intervals². The confidence interval was set at 95%.

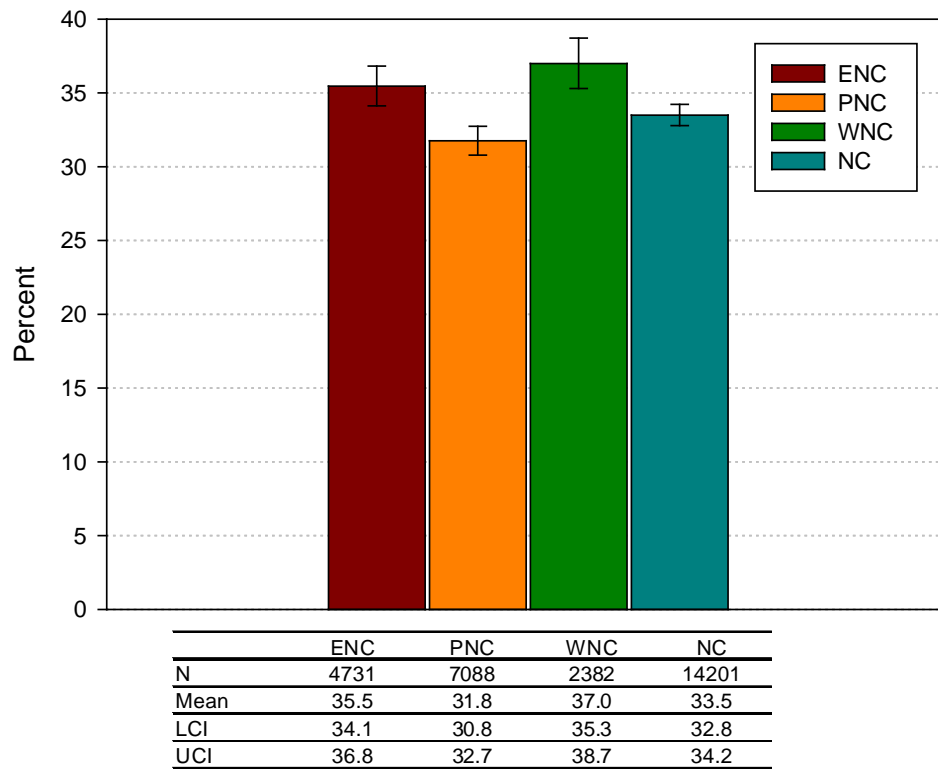
This report contains differences in:

1. The percentage of NC adults who had not visited dentists for any reason in the past year by NC region, income, education, race/ethnicity and age.
2. The percentage of adults who had not had their teeth cleaned by dental professionals in the past year by NC region, income, education, race/ethnicity and age.
3. The percentage of adults who had had teeth extracted by NC region, income, education, race/ethnicity and age.
4. The number of teeth extracted by region, education, race/ethnicity, and age group.

1. The use of dental services

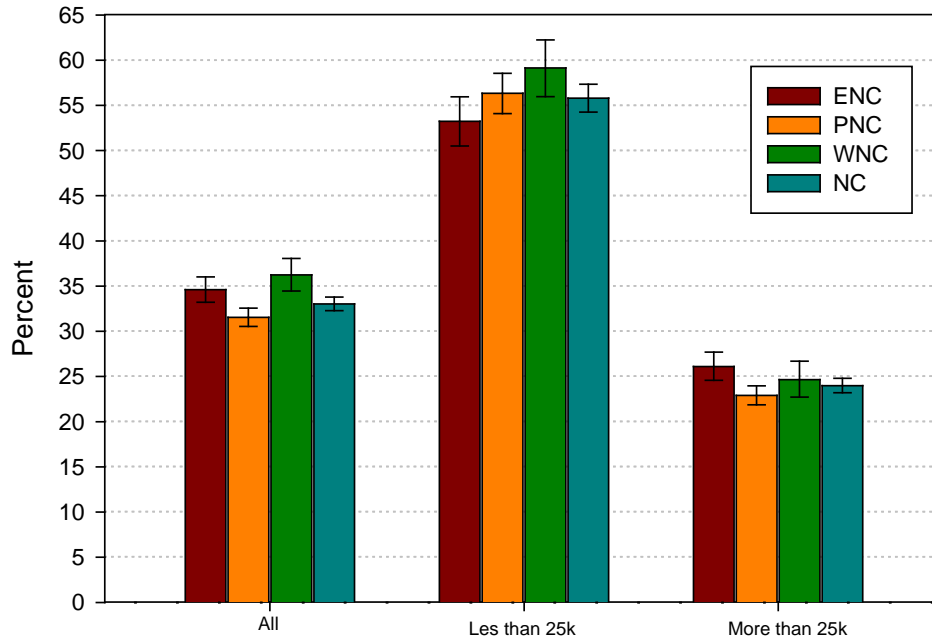
- a. There are substantial and statistically significant regional differences in the use of dental services: Both Eastern (35.5%) and Western regions (37.0%) had a higher percentage of people who did not visit a dentist in the past year than those in the Piedmont region (31.8%). (Figure 1-a).

Figure 1-a. Percent of Adults Who Have Not Visiting a Dentist in the Past Year by Region, NC BRFSS 2006, 2008, & 2010 Combined



- b. Annual household income has a large effect on dentist visits: More than half (55.8%) of North Carolinians whose household income was less than \$25,000 had not visited a dentist in the past year as compared to those whose income was more than \$25,000 (24%). (Figure 1-b). The effect of income is most substantial in the Western region, where almost 60% of those with income less than \$25,000 had not visited a dentist. There is no statistically significant difference for low income effect between the 3 regions, however.

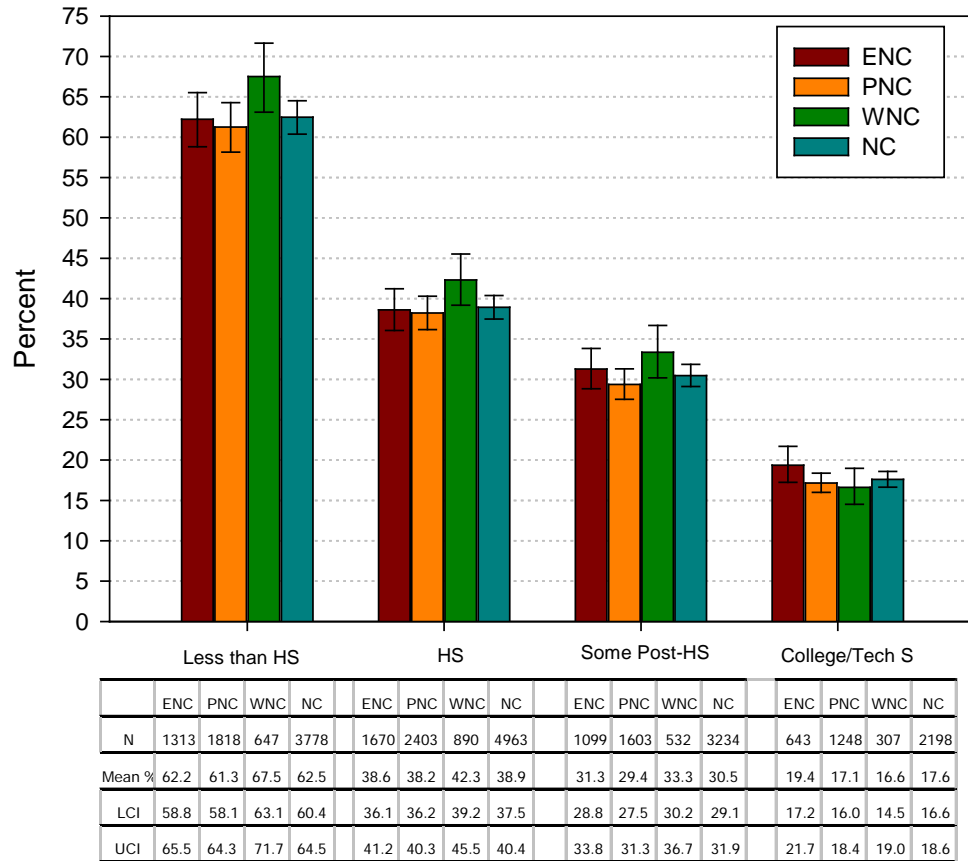
Figure 1-b. Percent of Adults Who Have Not Visited a Dentist in the Past Year by Income & Region, NC BRFSS 2006, 2008 & 2010 Combined



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	3958	6021	2007	11986	2099	3102	1175	6376	1859	2919	832	5610
Mean %	34.6	31.5	36.2	33.0	53.2	56.3	59.1	55.8	26.1	22.9	24.7	24.0
LCI	33.2	30.5	34.5	32.3	50.5	54.1	56.0	54.3	24.6	21.9	22.7	23.2
UCI	36.0	32.6	38.1	33.8	55.9	58.5	62.2	57.3	27.7	24.0	26.7	24.8

- c. Education exerts a large effect on dentist visits: A little more than 60% of those who did not complete high school had not visited a dentist in the past year as compared to those who had completed high school (38.9%), or those who had some post high school education (30.5%). North Carolinians who were college and technical school graduates had the lowest rate (17.6%). The effect of education is similar across the 3 regions (Figure 1-c).

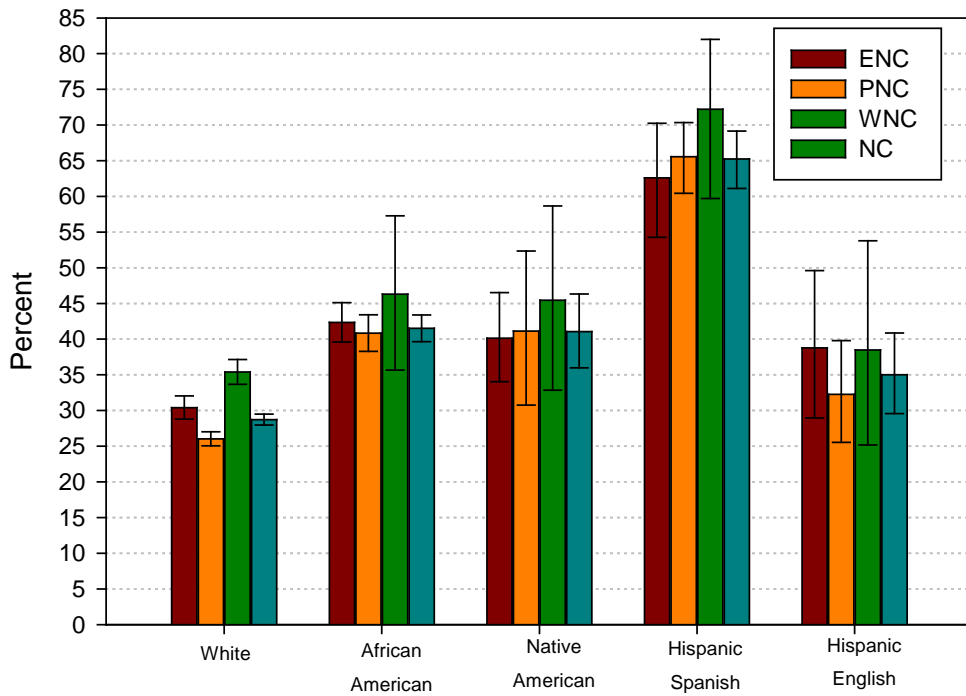
Figure 1-c. Percent of Adults Who Have Not Visited a Dentist in the Past Year by Education & Region, NC BRFSS 2006, 2008 & 2010 Combined



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	1313	1818	647	3778	1670	2403	890	4963	1099	1603	532	3234	643	1248	307	2198
Mean %	62.2	61.3	67.5	62.5	38.6	38.2	42.3	38.9	31.3	29.4	33.3	30.5	19.4	17.1	16.6	17.6
LCI	58.8	58.1	63.1	60.4	36.1	36.2	39.2	37.5	28.8	27.5	30.2	29.1	17.2	16.0	14.5	16.6
UCI	65.5	64.3	71.7	64.5	41.2	40.3	45.5	40.4	33.8	31.3	36.7	31.9	21.7	18.4	19.0	18.6

- d. There are substantial differences in dentist visits by race/ethnicity for the state as a whole. Whites had the lowest rate of those who had not visited a dentist in the past year (28.7%) followed by English-speaking Hispanics (38.5%), African Americans (41.5%), and Native Americans (41.0%). Spanish-speaking Hispanics had the highest percentage (65.2%), a disparity that exists for the state and across the three regions. The differences in the percent who had not visited a dentist are statistically significant for all non-white groups compared to white for the state as a whole. Within the ENC region, there is a statistically significant disparity in dental visits for African Americans, Native Americans and Spanish-speaking Hispanics compared to whites. Within the WNC region, only the difference between Spanish-speaking Hispanics and other groups is statistically significant. (Figure 1-d).

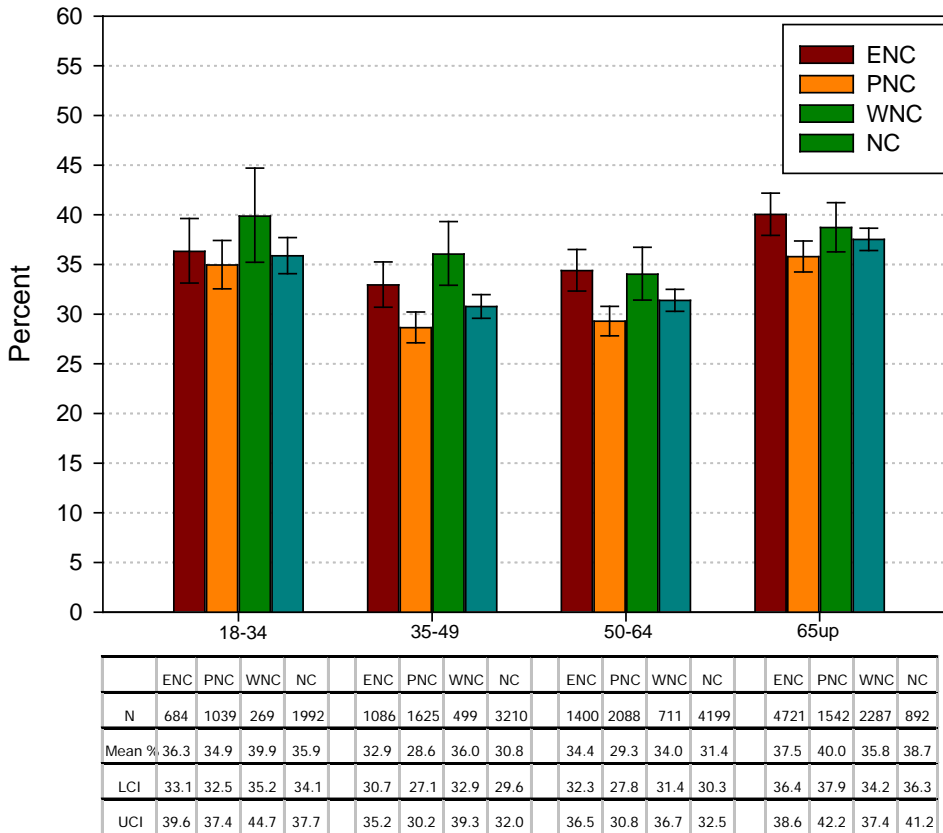
Figure 1-d. Percent of Adults Who Have Not Visited a Dentist in the Past Year by Race/Ethnicity & Region, NC BRFSS 2006, 2008, & 2010 Combined



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	2690	4836	2104	9630	1376	1443	78	2897	245	54	67	366	206	417	54	677	106	138	34	278
Mean %	30.4	26.0	35.4	28.7	42.3	40.8	46.3	41.5	40.1	41.1	45.5	41.0	62.6	65.6	72.2	65.2	38.8	32.3	38.5	35.0
LCI	28.8	25.0	33.7	28.0	39.6	38.3	35.7	39.6	34.0	30.8	32.8	36.0	54.3	60.4	59.7	61.1	29.0	25.5	25.2	29.6
UCI	32.0	27.0	37.2	29.5	45.1	43.4	57.3	43.4	46.5	52.4	58.7	46.3	70.2	70.3	82.0	69.2	49.6	39.8	53.8	40.9

- e. There are significant differences by age group in the use of dental services across the state. Fewer younger (18-34 yrs old) and older (65 yrs old and up) adults had visited a dentist in the past year than those in the middle. The regional differences are apparent in the middle age groups (35-64 yrs old): Fewer middle aged adults living in the Eastern or Western regions visited a dentist than those living in Piedmont. (Figure 1-e).

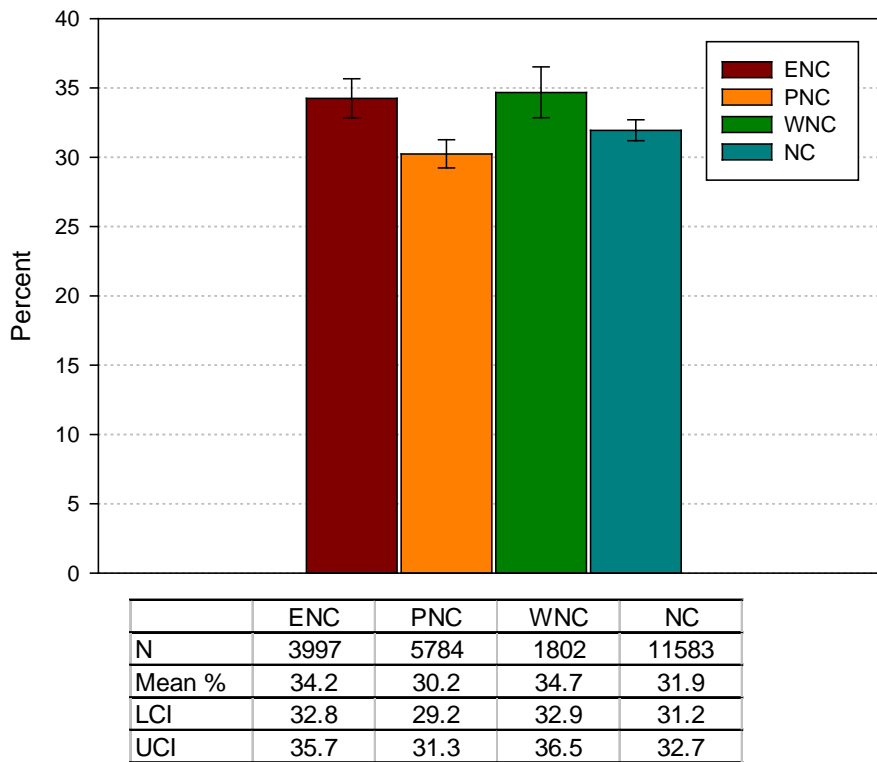
Figure 1-e. Percent of Adults Who Have Not Visited a Dentist in the Past Year by Age & Region, NC BRFSS 2006, 2008, & 2010 Combined



2. Adults who have not had teeth cleaned by a dentist or a dental hygienist in the past year

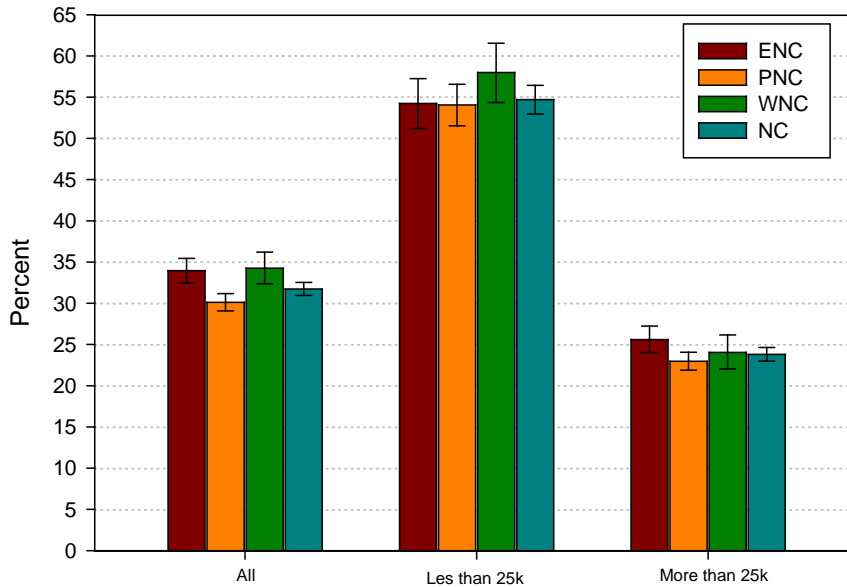
- a. There is a significant regional difference in teeth cleaning visits: The Piedmont region has the lowest percentage of residents who have not had teeth cleaned (30.2%) compared to the Eastern (34.2%) or the Western (34.7%) region. (Figure 2-a).

Figure 2-a. Percent of Adults Who Have Not Had Teeth Cleaned by a Dentist or Dental Hygienist in the Past Year by Region, NC BRFSS 2006, 2008, & 2009 Combined



- b. There is a large difference in dentist or hygienist visits for teeth cleaning by annual income level. 54.7% of North Carolinians whose household income was less than \$25,000 had not had teeth cleaned in the past year as compared to those whose income was more than \$25,000 (23.8%). Regional differences by income levels are not significant. (Figure 2-b).

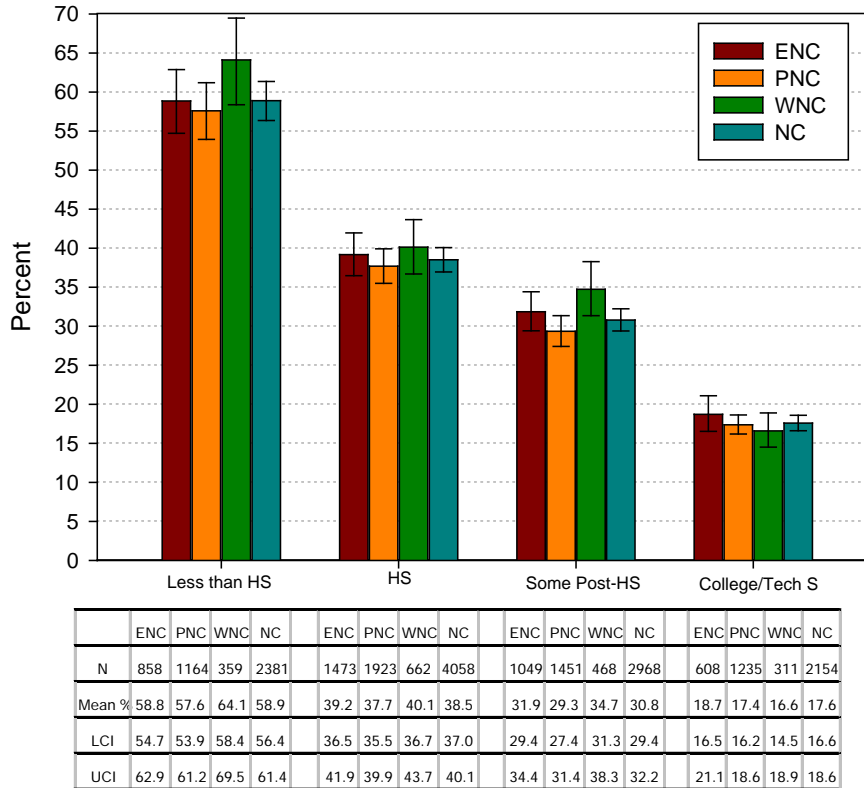
Figure 2-b. Percent of Adults Who Have Not Had Teeth Cleaned by a Dentist or Dental Hygienist in the Past Year by Income & Region, NC BRFSS 2006, 2008, & 2010 Combined



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	3424	5007	1550	9981	1713	2287	819	4819	1711	2720	731	5162
Mean %	34.0	30.1	34.3	31.7	54.2	54.1	58.0	54.7	25.6	23.0	24.0	23.8
LCI	32.5	29.1	32.4	31.0	51.2	51.5	54.3	53.0	24.0	21.9	22.0	23.0
UCI	35.4	31.2	36.2	32.5	57.2	56.6	61.5	56.4	27.2	24.1	26.2	24.6

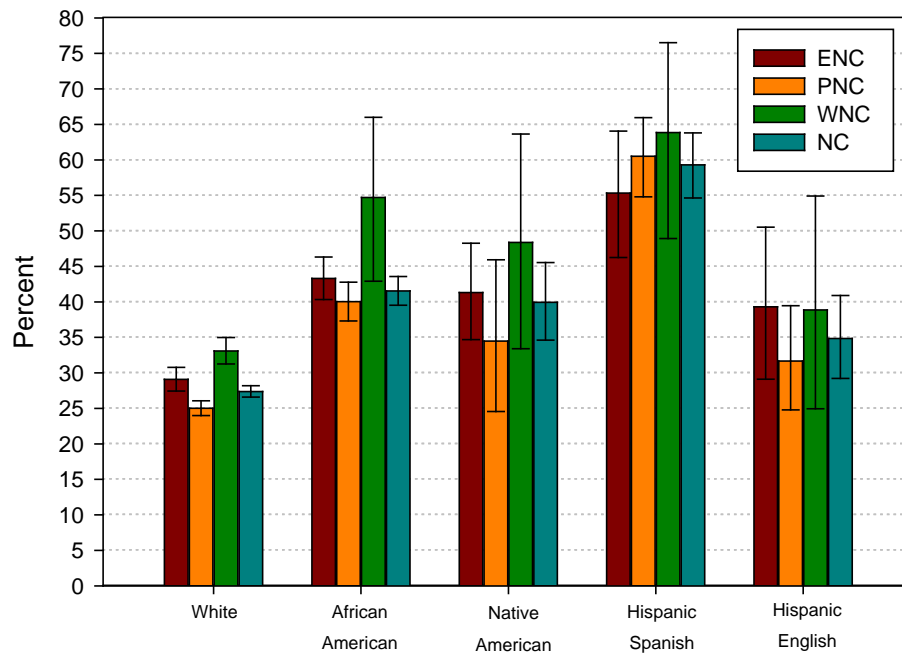
- c. There are very large differences in dental cleaning by education. 17.6% of North Carolinians who graduated from a college or technical school have not had teeth cleaned by professionals. In contrast, almost 60% of adults who had not completed high school have not had teeth cleaned in the past year. About 40% of those who completed high school and 30% of those had some post high school education have not had teeth cleaned in the past year. These differences by education are not significant by region. (Figure 2-c).

Figure 2-c. Percent of Adults Who Have Not Had Teeth Cleaned by a Dentist or Dental Hygienist in the Past Year by Education & Region, NC BRFSS 2006, 2008, & 2010 Combined



- d. For North Carolina as a whole, about 60% of Spanish-speaking adults have not had teeth cleaned within the past year, followed by African American (41.5%), Native American (40.0%) and English-speaking Hispanic adults (34.8%). 27.4% of Whites had not had a dentist visit for teeth cleaning. Regional differences by race are significant only among Whites. Among Whites, highest percentage of adults living in the Western region have not had teeth cleaned (33.1%), followed by those living in the Eastern region (29.1%) compared to those living in the Piedmont region (25.0%). (Figure 2-d).

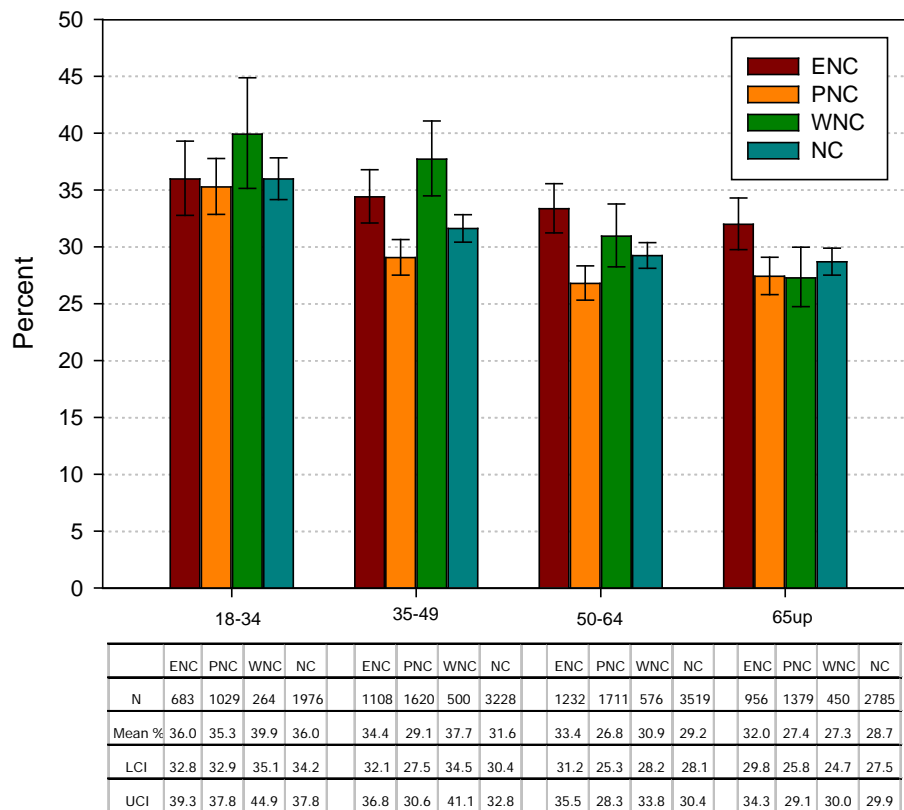
Figure 2-d. Percent of Adults Who Have Not Had Teeth Cleaned by a Dentist or Dental Hygienist in the Past Year by Race/ethnicity & Region, NC BRFSS 2006, 2008, & 2010 Combined



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	2211	3934	1581	7726	1221	1191	68	2480	222	45	46	313	152	332	41	525	98	113	32	243
Mean %	29.1	25.0	33.1	27.4	43.3	40.0	54.7	41.5	41.3	34.5	48.4	40.0	55.3	60.5	63.9	59.3	39.3	31.7	38.9	34.8
LCI	27.4	24.0	31.3	26.6	40.3	37.3	42.9	39.5	34.7	24.6	33.4	34.6	46.2	54.8	48.9	54.7	29.1	24.8	24.9	29.2
UCI	30.8	26.1	35.0	28.2	46.3	42.8	66.0	43.6	48.3	45.9	63.6	45.5	64.1	66.0	76.5	63.8	50.5	39.5	54.9	40.9

- e. There are age differences in dental cleaning visits. For the state as a whole, higher percentage of younger adults (18-34 yrs old age group) have not visited dental offices for teeth cleaning than the older adults (35-49, 50-64, and 65 yrs old and up). There are significant regional differences for middle and older age groups. For age groups, 35-49 and 50-64 yrs olds, higher percentage of adults living in the Eastern and Western regions have not had their teeth cleaned by dental professionals than those in the Piedmont region. For the oldest group, 65 yrs and up, a significantly higher percentage of those living in Eastern region have not had their teeth cleaned than those living in the other two regions. (Figure 2-e).

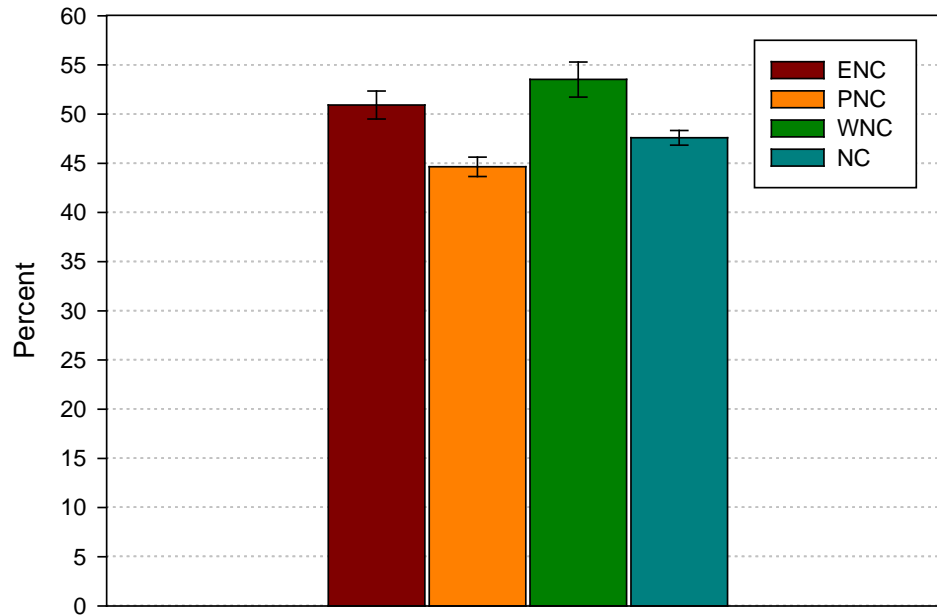
Figure 2-e. Percent of Adults Who Have Not Had Teeth Cleaned by a Dentist or Dental Hygienist in the Past Year by Age & Region, NC BRFSS 2006, 2008, & 2010 Combined



3. Adults who have had permanent teeth extracted

- a. There are significant regional differences among those who had one or more permanent teeth extracted. More residents in the Western and the Eastern regions had one or more permanent teeth extracted (53.5% and 50.9%, respectively) compared to adults living in the Piedmont region (44.6%). (Figure 3-a).

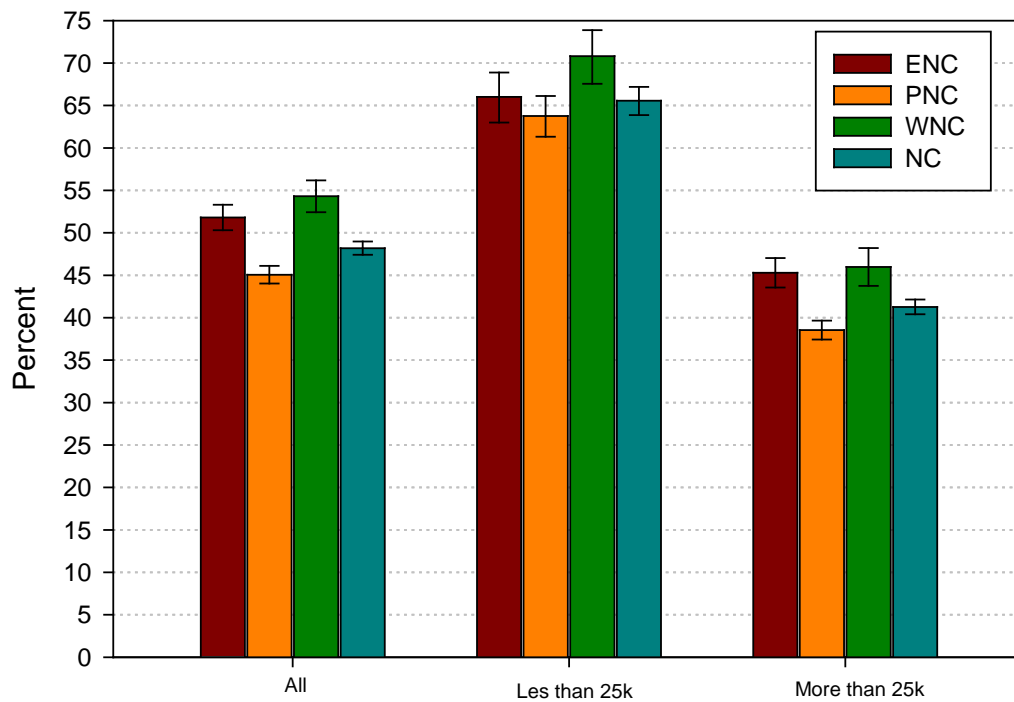
**Figure 3-a. Percent of Adults Who Have Had Permanent Teeth Extracted by Region
NC BRFSS 2006, 2008, & 2010**



	ENC	PNC	WNC	NC
N	8316	12621	4018	24955
Mean %	50.9	44.6	53.5	47.6
LCI	49.5	43.7	51.7	46.8
UCI	52.3	45.6	55.3	48.3

b. Annual household income also has a large effect on the risk of teeth extraction. For the state as a whole, 65.6% of adults who had annual household income of less than \$25,000 had one or more permanent teeth extracted compared to 41.3% of those whose annual household income was more than \$25,000. (Figure 3-b). Regional differences are more pronounced for those whose annual income is more than \$25,000. More adults with an annual income equal to or greater than \$25,000 living in the Eastern and Western regions had their teeth removed (45.3% and 46%, respectively) than those living in Piedmont (38.5%). (Figure 3-b).

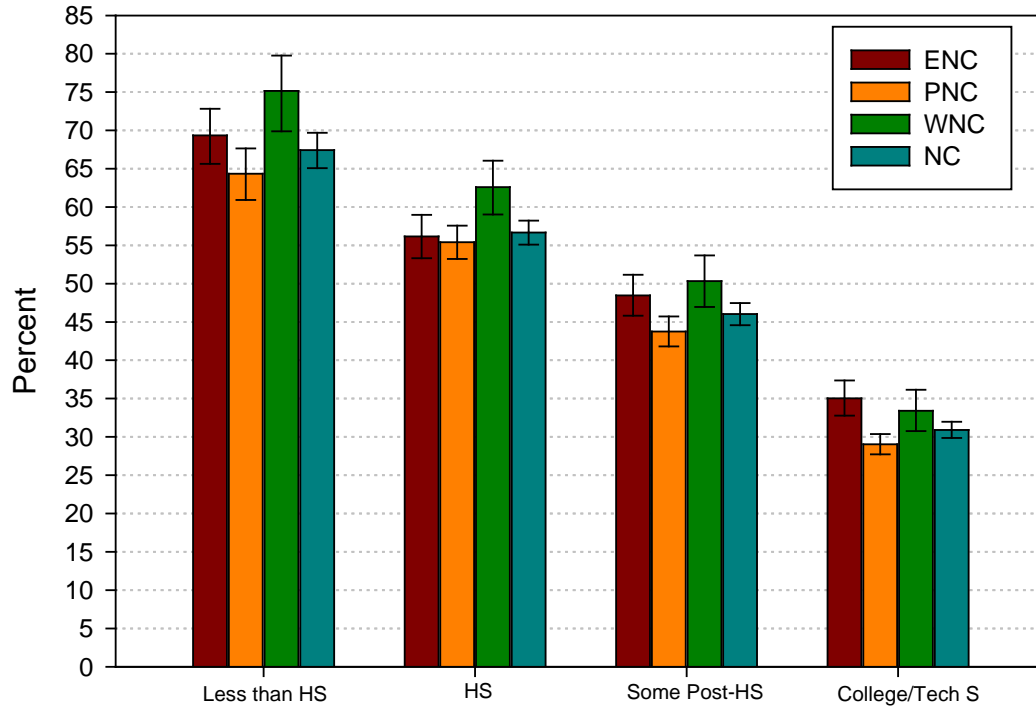
Figure 3-b. Percent of Adults Who Have Had Permanent Teeth Extracted by Income & Region, NC BRFSS 2006, 2008, & 2010 Combined



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	7049	10681	3423	21153	3074	4282	1608	8964	3975	6399	1815	12189
Mean %	51.8	45.1	54.3	48.2	66.0	63.8	70.8	65.6	45.3	38.5	46.0	41.3
LCI	50.3	44.0	52.4	47.4	63.0	61.3	67.6	63.9	43.6	37.4	43.7	40.4
UCI	53.3	46.1	56.2	49.0	68.9	66.1	73.9	67.2	47.0	39.7	48.2	42.1

- c. For the state as a whole, only 30.9% of graduates of colleges or technical schools had permanent teeth removed. For those with some post high school education, 46.0% had teeth extracted and for those with high school diploma, 56.7% had teeth extracted. More than twice as many of those who had not completed high school had permanent teeth extracted (67.4%) as those with college or technical school degrees. There are also significant regional differences. (Figure 3-c).

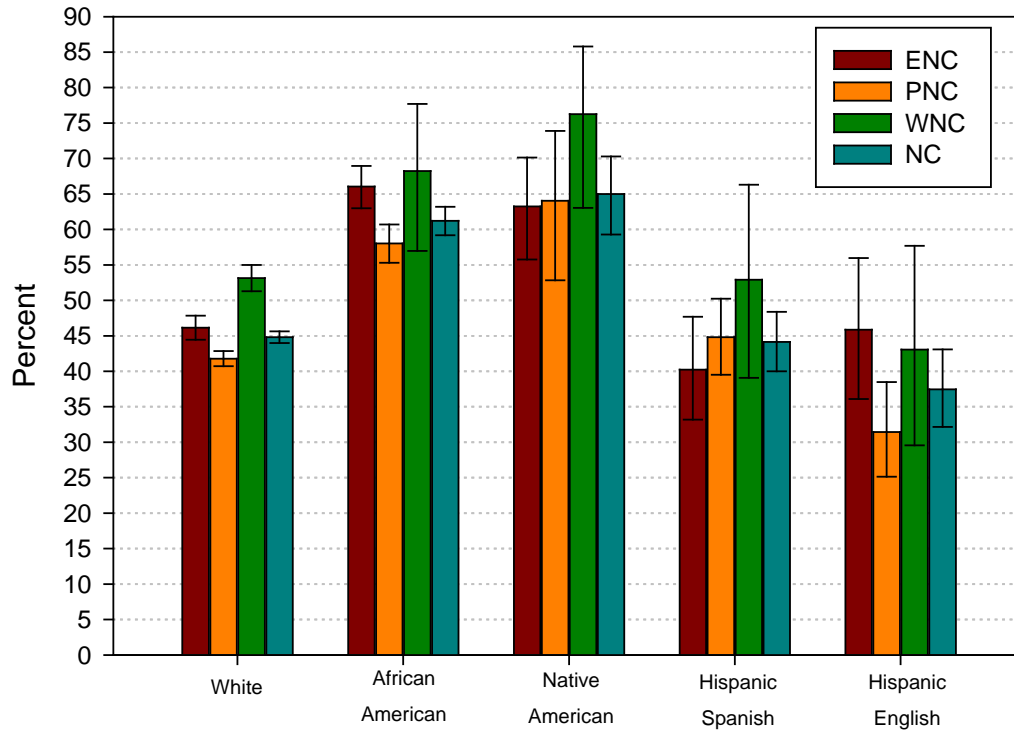
Figure 3-c. Percent of Adults Who Have Had Permanent Teeth Extracted by Education & Region, NC BRFSS 2006, 2008, & 2010



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	1729	2411	850	4990	3029	4358	1442	8829	2085	3107	995	6187	1461	2717	724	4902
Mean %	69.3	64.4	75.2	67.4	56.2	55.4	62.6	56.7	48.5	43.8	50.3	46.0	35.0	29.0	33.4	30.9
LCI	65.6	60.9	69.9	65.1	53.3	53.2	59.0	55.1	45.8	41.8	47.0	44.6	32.8	27.7	30.8	29.9
UCI	72.8	67.6	79.8	69.7	59.0	57.6	66.0	58.2	51.1	45.7	53.7	47.5	37.4	30.4	36.1	32.0

- d. There are large differences by race in percentages of those who have had teeth extracted. Native American and African American adults had higher rates of having had teeth extracted (65.0% and 61.2%, respectively) than White (44.8%) or English-speaking or Spanish-speaking Hispanic adults (37.5% and 44.1%). (Figure 3-d).

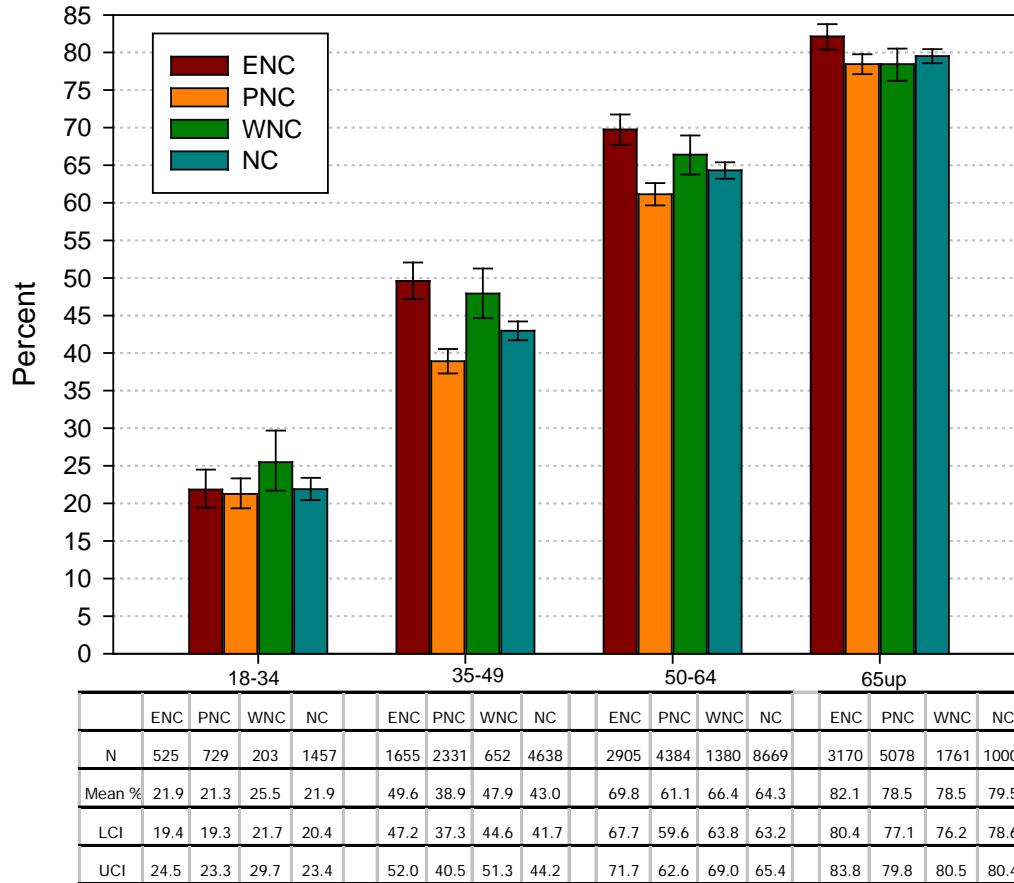
Figure 3-d. Percent of Adults Who Have Had Permanent Teeth Extracted by Race/ethnicity & Region, NC BRFSS 2006, 2008, & 2010



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	5089	9363	3628	18080	2302	2371	129	4802	425	97	113	635	155	347	43	545	160	173	46	379
Mean %	46.1	41.8	53.1	44.8	66.0	58.0	68.2	61.2	63.2	64.0	76.3	65.0	40.2	44.8	52.9	44.1	45.9	31.4	43.1	37.5
LCI	44.4	40.7	51.3	44.0	63.0	55.3	57.0	59.2	55.8	52.8	63.1	59.3	33.2	39.5	39.1	40.0	36.1	25.1	29.6	32.1
UCI	47.8	42.8	55.0	45.6	69.0	60.7	77.7	63.2	70.1	73.9	85.8	70.3	47.7	50.2	66.3	48.4	56.0	38.5	57.7	43.1

- e. Age exerts a large effect on risk factors in oral health. Significantly more older adults (65 yrs and up) have had their teeth extracted. Except for the younger age group (18-34 yrs olds), there are also regional effects: More adults living in eastern NC have had their teeth extracted than the average adults in NC. (Figure 3-e).

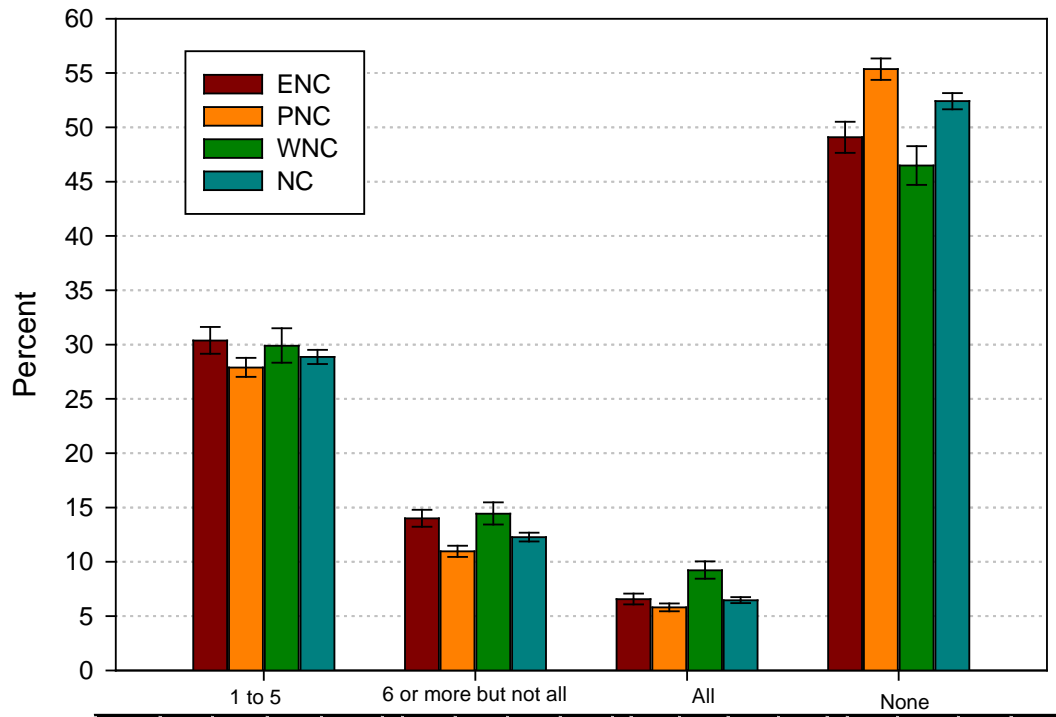
Figure 3-e. Percent of Adults Who Have Had Permanent Teeth Extracted by Age & Region, NC BRFSS 2006, 2008, & 2010 Combined



4. The number of permanent teeth removed by region, education, or race/ethnicity

- a. There are regional differences in the number of permanent teeth removed. Generally, more adults living in the Eastern and Western regions had lost more teeth than those living in the Piedmont region. The regional difference is greatest for the percentages of those who had no teeth removed. 55.4% of those living in the Piedmont region had no teeth removed compared to 49.1% those in Eastern and 46.5% of those in Western Region. (Figure 4-a).

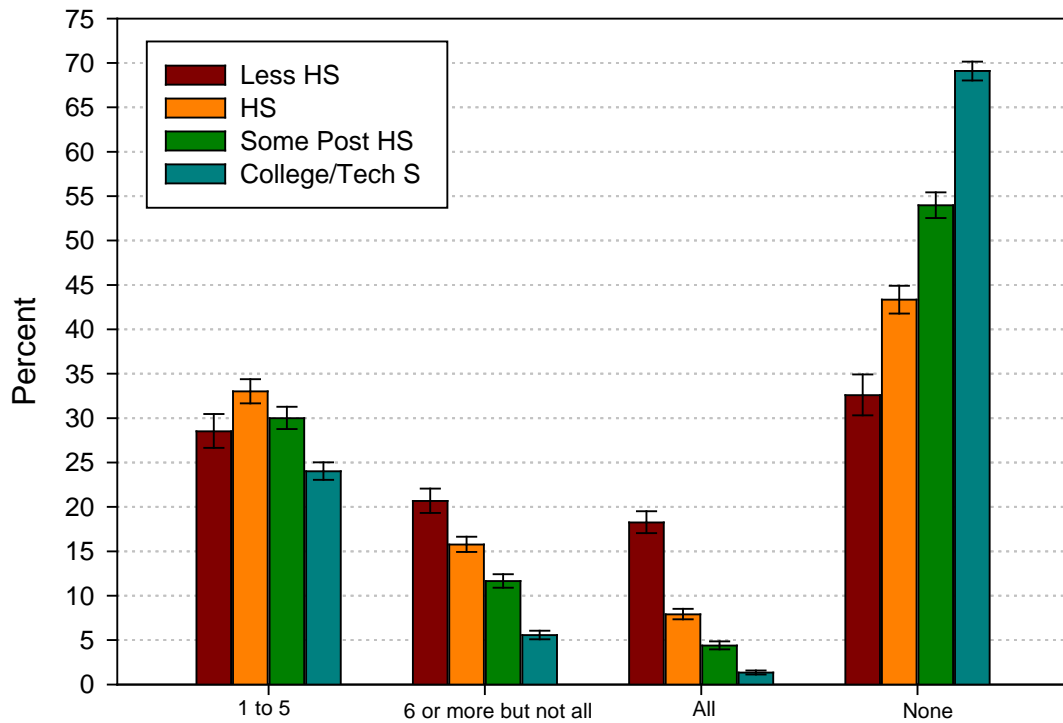
**Figure 4-a. Number of Permanent Teeth Removed by Region
NC BRFSS 2006, 2008 & 2010 Combined**



	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC	ENC	PNC	WNC	NC
N	4414	6942	1926	13282	2568	3569	1205	7342	1334	2110	887	4331	5110	10312	2397	17819
Mean %	30.4	27.9	29.9	28.9	14.0	11.0	14.4	12.3	6.6	5.8	9.2	6.5	49.1	55.4	46.5	52.4
LCI	29.2	27.0	28.3	28.2	13.2	10.4	13.4	11.9	6.1	5.4	8.4	6.2	47.7	54.4	44.7	51.7
UCI	31.6	28.8	31.5	29.5	14.8	11.5	15.5	12.7	7.1	6.2	10.0	6.7	50.5	56.3	48.3	53.2

- b. The number of teeth removed varied greatly by level of education. The adults who did not complete high school had lost 6 or more teeth than those who completed high school or had higher education. 18% of those who had less than high school education lost all teeth compared to 8% of high school graduates, 4% of those with some post high school education and 1% of college or technical school graduates. 32.6% of those less than high school education had no teeth lost while 69% of college or technical school graduates had no teeth removed. (Figure 4-b).

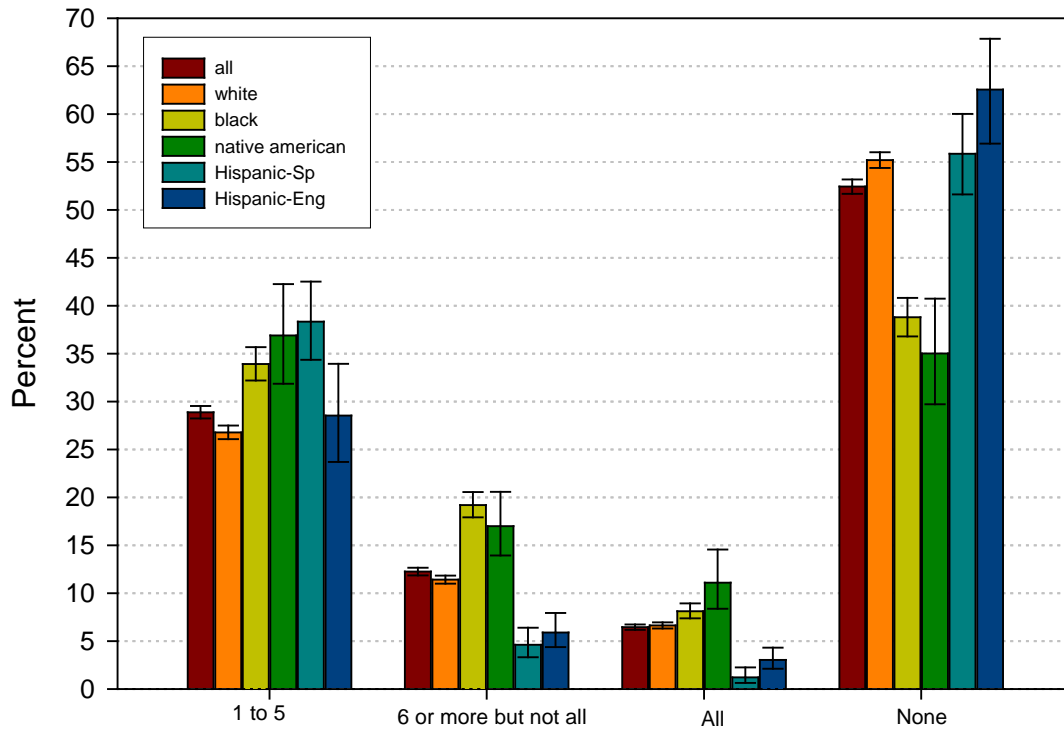
**Figure 4-b. Number of Permanent Teeth Removed by Education
NC BRFSS 2006, 2008, & 2010 Combined**



	L HS	HS	HS+	Col	L HS	HS	HS+	Col	L HS	HS	HS+	Col	L HS	HS	HS+	Col
N	1488	4419	3725	3623	1743	2808	1747	1034	1759	1602	715	245	1064	3742	4622	8356
Mean %	28.5	33.0	30.0	24.0	20.7	15.8	11.6	5.6	18.2	7.9	4.4	1.3	32.6	43.3	54.0	69.1
LCI	26.6	31.7	28.8	23.1	19.3	14.9	10.9	5.1	17.1	7.3	3.9	1.1	30.3	41.8	52.5	68.0
UCI	30.5	34.4	31.3	25.0	22.1	16.6	12.4	6.1	19.5	8.5	4.9	1.6	34.9	44.9	55.4	70.1

- c. There are also large differences in number of teeth removed by race/ethnicity. In general, more African Americans and Native Americans lost more teeth than white or Hispanic Americans. The differences are largest among the adults who had no teeth removed. 55% of white had no teeth removed while 39% of African Americans and 35% of Native Americans had lost no teeth. (Figure 4-c).

**Figure 4-c. Number of Permanent Teeth Removed by Race/ethnicity
NC BRFSS 2006, 2008, & 2010 Combined**



	All	White	African	Native	Hispanic	Hispanic	All	White	African	Native	Hispanic	Hispanic	All	White	African	Native	Hispanic	Hispanic	All	White	African	Native	Hispanic	Hispanic
		American	American	American	Spanish	English		American	American	American	Spanish	English		American	American	American	Spanish	English		American	American	American	Spanish	English
N	13217	9623	2328	314	467	238	7300	5177	1684	201	60	89	4296	3280	790	120	18	52	17724	14307	1859	227	532	402
Mean %	28.9	26.8	33.9	36.9	38.3	28.5	12.2	11.4	19.2	17.0	4.6	5.9	6.4	6.6	8.1	11.1	1.2	3.0	52.4	55.2	38.8	35.0	55.9	62.5
LCI	28.2	26.1	32.2	31.8	34.3	23.7	11.9	11.0	17.9	13.9	3.3	4.4	6.2	6.3	7.4	8.4	0.6	2.1	51.7	54.4	36.8	29.7	51.6	56.9
UCI	29.5	27.5	35.7	42.3	42.5	33.9	12.7	11.8	20.5	20.6	6.4	7.9	6.7	7.0	8.9	14.5	2.3	4.3	53.2	56.0	40.8	40.7	60.0	67.9

References

¹. North Carolina Behavioral Risk Factor Surveillance System. North Carolina Center for Health Statistics, Division of Public Health. Raleigh, NC.

². Research Triangle Institute (2002). SUDAAN Release 9.0. Research Triangle Park, NC.